

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-308314  
(43)Date of publication of application : 05.11.1999

(51)Int.Cl.

H04M 1/19  
H04B 7/26  
H04M 1/02  
H04M 1/03  
H04M 1/60

(21)Application number : 10-110636

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(22)Date of filing : 21.04.1998

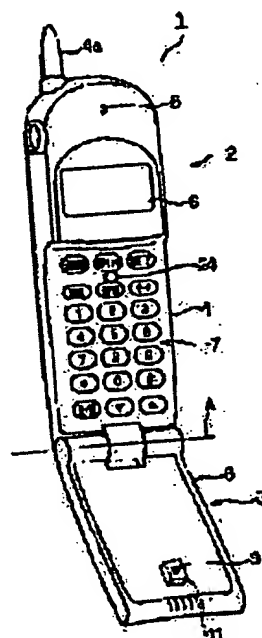
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(54) TELEPHONE SET

(57)Abstract:

PROBLEM TO BE SOLVED: To keep excellent speech quality of the portable telephone set provided with a close-talking type ECM independently of its operating mode and to enhance the operating convenience.

SOLUTION: When a flip 3 is turned open with respect to a main body 2, both sound holes of a close-talking type ECM 11 are open and a sound wave acts on a diaphragm in both directions, and in the case of making a speech while approaching the close-talking type ECM 11 to the mouse of the user, a proximity effect is obtained and the excellent speech quality is ensured. On the other hand, when the flip 3 is turned closed with respect to the main body 2, one sound hole of the close-talking type ECM 11 is closed by a packing 24, only the other sound hole is open and the sound wave acts on the diaphragm in one direction only. That is, the close-talking type ECM 11 acts like an omnidirectional ECM virtually and even in the case that a speech is made while the close-talking type ECM 11 is apart from the mouse, the excellent speech quality is ensured.



LEGAL STATUS

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[Date of request for examination] 09.06.2000  
[Date of sending the examiner's decision of rejection]  
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]  
[Date of final disposal for application]  
[Patent number] 3541673  
[Date of registration] 09.04.2004  
[Number of appeal against examiner's decision of rejection]  
[Date of requesting appeal against examiner's decision of rejection]  
[Date of extinction of right]

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CLAIMS

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[Claim(s)]

[Claim 1] A body and the moving-part material which carries out movable between the 1st operating state location and the 2nd operating state location to this body, The close-talking electret capacitor microphone which has the sound hole by which an acoustic wave can invade into the both sides which are prepared in either of said bodies and said moving-part material, and sandwich a diaphragm, It has the sound hole lock out member prepared in the different one from the direction in which said close-talking electret capacitor microphone of said bodies and said moving-part material was formed. Said close-talking electret capacitor microphone When said moving-part material is located in said 1st operating state location While being invaded into an acoustic wave from the sound hole of said both sides by opening both sound holes wide, when said moving-part material is located in said 2nd operating state location Telephone equipment characterized by being constituted so that it may be invaded into an acoustic wave only from one [ said ] sound hole, when one sound hole is opened wide and the sound hole of another side is blockaded by said sound hole lock out member.

[Claim 2] It is telephone equipment according to claim 1 characterized by for said moving-part material consisting of flips formed rotatable to the body, and constituting this flip so that the location closed to said body may be made into said 2nd operating state location, while making into said 1st operating state location the location opened to said body.

[Claim 3] Telephone equipment according to claim 1 or 2 characterized by being constituted based on having detected that had a key stroke detection means to detect that the predetermined key stroke was made, and the predetermined key stroke was made by this key stroke detection means so that actuation may become possible in either mode of the normal mode and handsfree mode.

[Claim 4] Telephone equipment according to claim 1 or 2 characterized by being constituted based on having detected that had a movable detection means to detect that said moving-part material carried out movable, and said moving-part material carried out movable with this movable detection means so that actuation may become possible in either mode of the normal mode and handsfree mode.

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to telephone equipment equipped with the close-talking electret capacitor microphone which has the sound hole by which an acoustic wave can invade into the both sides which sandwich a diaphragm.

[0002]

[Problem(s) to be Solved by the Invention] Conventionally, as a microphone of a cell phone unit or personal handy phone equipment (PHS), the electret capacitor microphone (it is hereafter called ECM (Electret Condenser Microphone) for short) is adopted. If it is in the condition close to a fixed electrode, it has the composition that the diaphragm which carried out permanent electrification of the front face has been arranged and an acoustic wave invades from a sound hole, according to a diaphragm vibrating, the electrostatic capacity between a diaphragm and a fixed electrode changes, an acoustic wave will be changed into an electrical signal and this ECM will be outputted. In this case, in such ECM, an indirectional (omnidirectional characteristic) property is acquired by preparing the sound hole into which an acoustic wave invades only in one direction to a diaphragm, and considering as the configuration on which an acoustic wave acts only from one direction to a diaphragm.

[0003] By the way, since such a cell phone unit and personal handy phone equipment are used outdoors etc. by the use gestalt in many cases, it is required that a perimeter [ -proof ] noise property should be good. From such a situation, it considers adopting a close-talking electret capacitor microphone (it being hereafter called Close-talking ECM for short) excellent in the perimeter [ -proof ] noise property instead of ECM mentioned above as a microphone of a cell phone unit or personal handy phone equipment by recent years.

[0004] This close-talking ECM has the composition that the sound hole was prepared in the both sides which sandwich a diaphragm, and the difference of the sound pressure of the acoustic wave which invaded through one sound hole, and the sound pressure of the acoustic wave which invaded through the sound hole of another side acts on a diaphragm as a sound pressure gradient. In this case, sound pressure gradient  $P_s$  when an acoustic wave is given to Close-talking ECM as a spherical wave Sound pressure gradient  $P_f$  when an acoustic wave is given to Close-talking ECM as a plane wave It differs and is these sound pressure gradient  $P_s$ . Sound pressure gradient  $P_f$  Generally a ratio is expressed with the distance  $c$ :acoustic-velocity  $f$ :frequency from a distance  $r$ :sound source between  $P_s/P_f = \{1 - (2d/r) + (c/2\pi fr)^2\}$   $1/2d$ :sound terminals.

[0005] It is the sound pressure gradient [ as opposed to / in Close-talking ECM / so that clearly from the above-mentioned formula / a spherical wave in a low frequency band ]  $P_s$ . Sound pressure gradient  $P_f$  to a plane wave It has the property that a ratio becomes large, that is, the sensibility to a spherical wave becomes good relatively rather than the sensibility to a plane wave.

[0006] By the way, a microphone will be given in the condition near [ since the acoustic wave of the voice uttered by people since the microphone was usually brought close to the mouth and it talked over the telephone when the user generally used cell phone unit and personal handy phone equipment has a

comparatively small distance of a sound source and a microphone ] a spherical wave. On the other hand, since the distance of a sound source and a microphone is comparatively large, the acoustic wave of a perimeter noise will be given to a microphone in the condition near a plane wave.

[0007] Therefore, in that as which Close-talking ECM was adopted as a microphone, since it has a property which Close-talking ECM mentioned above, the sensibility to the acoustic wave of the voice uttered by people becomes good relatively rather than the sensibility to the acoustic wave of a perimeter noise, that is, the proximity effect comes to be acquired, there is little effect by the perimeter noise and a speech quality is secured good.

[0008] However, if it puts in another way, when placing the cell phone unit and personal handy phone equipment with which Close-talking ECM was adopted as a microphone for example, on a desk, separating them from the month and talking over the telephone, since the distance of a sound source and a microphone is comparatively large, I hear that the sensibility to the acoustic wave of the voice uttered by people will fall, and a speech quality will deteriorate, and there is this. Moreover, since there is a situation that a speech quality will deteriorate when the distance of a sound source and a microphone becomes comparatively large in this way, a use gestalt will be restricted and there is also a problem of being inferior to user-friendliness.

[0009] It is in this invention being made in view of the above-mentioned situation, and offering the telephone equipment which the purpose can keep a speech quality good in the thing equipped with the close-talking electret capacitor microphone which has the sound hole by which an acoustic wave can invade into the both sides which sandwich a diaphragm, without being restricted to a use gestalt, and can aim at improvement in user-friendliness by it.

[0010]

[Means for Solving the Problem] If moving-part material is located in the 1st operating state location to a body, since the sound hole of the both sides of a close-talking electret capacitor microphone (close-talking ECM) will come to be opened wide according to invention of claim 1, an acoustic wave comes to invade from both sound holes. Therefore, since Close-talking ECM comes to act with an original property at this time, when a user uses telephone equipment according to an anticipated-use gestalt (i.e., when bringing Close-talking ECM close to the month and talking over the telephone), the proximity effect is acquired and a speech quality comes to be secured good.

[0011] On the other hand, since one sound hole of Close-talking ECM is opened wide and the sound hole of another side comes to be blockaded by the sound hole lock out member when moving-part material is located in the 2nd operating state location to a body, an acoustic wave comes to invade only from one sound hole. therefore -- since Close-talking ECM comes to act as an indirectional (omnidirectional characteristic) electret capacitor microphone (ECM) in false at this time -- a user -- telephone equipment -- usually -- \*\*\*\* -- when using it according to a different use gestalt that is, even if it is the case where separate Close-talking ECM from the month and it talks over the telephone, a speech quality comes to be secured good.

[0012] Whether it is the case where bring Close-talking ECM close to the month, and it talks over the telephone by carrying out a deer and carrying out movable [ of the moving-part material ] between the 1st operating state location and the 2nd operating state location in this thing or is the case where separate Close-talking ECM from the month and it talks over the telephone, in the case of both sides, a speech quality can be secured good. Thereby, improvement in user-friendliness can be aimed at so that a use gestalt may not be restricted.

[0013] According to invention of claim 2, the operation effectiveness which was indicated to claim 1 can be acquired by comparatively easy actuation of rotating a flip to a body.

[0014] According to invention of claim 3, if a predetermined key stroke is carried out, telephone equipment will come to operate in either mode of the normal mode and handsfree mode. By carrying out a deer, making the 1st operating state location carry out movable [ of the moving-part material ], and performing a further predetermined key stroke in this thing, it can have an original property, Close-talking ECM can be made to act, where telephone equipment is made into the normal mode now, and, thereby, a speech quality can be made suitable.

[0015] On the other hand, where telephone equipment is made into handsfree mode by making the 2nd operating state location carry out movable [ of the moving-part material ], and performing a further predetermined key stroke, while making Close-talking ECM act as indirectional ECM in false, an output level and an input level can be made suitable now, and, thereby, a speech quality can be made suitable also in this case.

[0016] According to invention of claim 4, movable, then telephone equipment come to operate moving-part material in either mode of the normal mode and handsfree mode. The same operation effectiveness as a thing according to claim 3 can be acquired by carrying out a deer and carrying out movable [ of the moving-part material ] between the 1st operating state location and the 2nd operating state location in this thing. Moreover, since it is not necessary to perform a key stroke at all at this time, improvement in operability can be aimed at.

[0017]

[Embodiment of the Invention] Hereafter, this invention is explained with reference to drawing 1 thru/or drawing 6 about the 1st example applied to the personal handy phone equipment (PHS) of a microphone flip mold (mold with which the microphone was formed in the flip). First, in drawing 1 which shows the whole personal handy phone equipment configuration of a microphone flip mold, to the body 2, the rotation axis A is formed in the flip 3 as moving-part material rotatable as a rotation core, and personal handy phone equipment 1 is constituted. It is in a body 2 and the sound hole 5 is formed in the upper part of the body case 4 made from plastics, it is in the interior of the body case 4, and the loudspeaker (not shown) is arranged in the part corresponding to the above-mentioned sound hole 5. The acoustic wave which carried out the deer and was emitted from the loudspeaker is outputted outside through a sound hole 5.

[0018] Moreover, the display 6 is formed in the body case 4, it is in the interior of the body case 4, and the liquid crystal display (not shown) is arranged in the part corresponding to the above-mentioned display 6. When a deer is carried out and a liquid crystal display drives, the telephone number, a message, etc. are displayed on a display 6.

[0019] It is in a body 2 and the key stroke section 7 is formed in the drawing 1 Nakashita half section. In this key stroke section 7 A "message" key, "re-dialing" key, "termination" key, a "telephone directory" key, A "hold" key, a "mode" key, the numerical keypad of - "9" and "0" "\*" (asterisk) key, the "# (Sharp)" key, "sound recording/playback" key, a "rise scrolling" key, and the various keys of a "dounce crawl" key are arranged. Moreover, antenna case section 4a is prepared in the body case 4 at one at the upper part side of the body case 4, and the whip antenna (not shown) is arranged in the interior of the antenna case section 4a.

[0020] It is in flip 3, sound holes 9 and 10 are formed in the both-sides surface part of the flip case 8 made from plastics so that it may counter, as shown also in drawing 2, it is in the interior of the flip case 8, and the close-talking electret capacitor microphone (it is hereafter called Close-talking ECM for short) 11 is arranged in the part corresponding to the above-mentioned sound holes 9 and 10. In addition, the sound hole 9 is shown in drawing 1.

[0021] Close-talking ECM 11 has composition as shown in drawing 3. That is, it is in the interior of the case 12 of close-talking ECM 11, and the printed circuit board 13 is arranged by the method of drawing 3 Nakashita, and FET15 which constitutes a bypass capacitor 14 and an impedance-conversion circuit is mounted on the printed circuit board 13. After having been supported by the insulator 16, the fixed electrode 17 is arranged by the method of drawing 3 Nakagami of a printed circuit board 13, and the diaphragm 19 is arranged by the method of drawing 3 Nakagami of this fixed electrode 17 in the condition of having consisted a fixed electrode 17 and predetermined spacing with the spacer 18. This diaphragm 19 consists for example, of giant-molecule plastic film, and permanent electrification of the front face was carried out by having performed special electrical treatment (the electret was carried out).

[0022] Moreover, the sound hole 20 which is open for free passage to one sound hole 9 of the flip 3 mentioned above is formed in the drawing 3 Nakagami surface part of a case 12, a deer is carried out, an acoustic wave trespasses upon the interior of the case 12 of close-talking ECM 11 through the sound

hole 9 of flip 3, and the sound hole 20 of close-talking ECM 11 from the exterior, and the acoustic wave which invaded acts on a diaphragm 19.

[0023] On the other hand, the sound hole 21 which is open for free passage to the sound hole 10 of another side of the flip 3 mentioned above is formed in the drawing 3 Nakashita surface part of a case 12, and a sound hole 22 is formed in a printed circuit board 13, and sound holes 23 and 23 are further formed in the fixed electrode 17. A deer is carried out, an acoustic wave trespasses upon the interior of the case 12 of close-talking ECM 11 through the sound hole 10 of flip 3, and the sound hole 21 of close-talking ECM 11 from the exterior, and the acoustic wave which invaded acts on a diaphragm 19 through the sound hole 22 of a printed circuit board 13, and the sound holes 23 and 23 of a fixed electrode 17.

[0024] Thus, driver voltage is supplied through high resistance between a diaphragm 19 and a fixed electrode 17, and the constituted close-talking ECM 11 is in the condition. If it trespasses upon the interior of a case 12 as the acoustic wave mentioned above, and it acts on a diaphragm 19 According to a diaphragm 19 vibrating, the electrostatic capacity between a diaphragm 19 and a fixed electrode 17 changes, impedance conversion of the output voltage is carried out by the above-mentioned impedance-conversion circuit, and it is outputted.

[0025] It is in the key stroke section 7 of a body 2, and the packing 24 (refer to drawing 1) which consists of silicone rubber as a sound hole lock out member is formed in the predetermined part. In this case, as shown in drawing 4, when the location closed to the body 2 has flip 3, one sound hole 9 of flip 3 is blockaded with packing 24, as shown in drawing 5. In addition, elastic deformation is carried out although packing 24 is slight at this time.

[0026] And in the personal handy phone equipment 1 constituted in this way, if a key stroke to set CPU as the normal mode and for a user set it as handsfree mode, if a key stroke for CPU to operate in either mode of the normal mode or handsfree mode, and for a user set it as the normal mode is performed is performed, CPU will be set as handsfree mode. In this case, when CPU is set as handsfree mode, as for personal handy phone equipment 1, the output level of a loudspeaker and the input level of close-talking ECM 11 go up rather than the time of CPU being set as the normal mode.

[0027] Next, an operation of the above-mentioned configuration is explained. If a user does rotation actuation of the flip 3 in the location (1st operating state location as used in the field of this invention) opened to the body 2 as shown in drawing 2, at this time, the sound holes 9 and 10 of flip 3 will not be blockaded, that is, the sound holes 20 and 21 of close-talking ECM 11 will not be blockaded, and both these sound holes 20 and 21 will come to be opened wide. Therefore, if it is in close-talking ECM 11, while an acoustic wave invades through a sound hole 20 from the exterior (refer to drawing 2 Nakaya mark P), an acoustic wave comes (refer to drawing 2 Nakaya mark Q) to invade through a sound hole 21 from the exterior, that is, an acoustic wave invades from the direction of both, and it comes to act on a diaphragm 19.

[0028] If a user has the personal handy phone machine 1 in a hand, brings close-talking ECM 11 close to the month and talks over the telephone at this time, the acoustic wave of the voice uttered by people Since the distance of a sound source and close-talking ECM 11 is comparatively small, it is given to close-talking ECM 11 in the condition near a spherical wave. On the other hand, the acoustic wave of a perimeter noise Since the distance of a sound source and close-talking ECM 11 is comparatively large, with the property which it will be given to close-talking ECM 11 in the condition near a plane wave, and close-talking ECM 11 has The sensibility to the acoustic wave of the voice uttered by people becomes good relatively rather than the sensibility to the acoustic wave of a perimeter noise, that is, the proximity effect comes to be acquired. Thereby, a speech quality comes to be secured good.

[0029] As shown in drawing 4, when a user does rotation actuation of the flip 3, in the location (2nd operating state location as used in the field of this invention) closed to the body 2 At on the other hand, this time As one sound hole 9 of flip 3 mentioned above, it is blockaded with packing 24. That is, one sound hole 20 of close-talking ECM 11 is blockaded, and the sound hole 10 of another side of flip 3 is not blockaded, that is, only the sound hole 21 of another side of close-talking ECM 11 comes to be opened wide. Therefore, if it is in close-talking ECM 11, an acoustic wave comes (refer to drawing 5 Nakaya mark R) to invade only through a sound hole 21 from the exterior, that is, an acoustic wave

comes to act on a diaphragm 19 from one direction. Namely, close-talking ECM 11 comes to act as an indirectional (omnidirectional characteristic) electret capacitor microphone (it is hereafter called ECM for short) at this time.

[0030] If a user places the personal handy phone machine 1 for example, on a desk, separates close-talking ECM 11 from the month and talks over the telephone at this time, since close-talking ECM 11 will act as indirectional (omnidirectional characteristic) ECM, even if it is this case, a speech quality comes to be secured good.

[0031] Thus, if rotation actuation is carried out, since according to the 1st example the sound holes 20 and 21 of the both sides of close-talking ECM 11 will be opened wide and an acoustic wave will come to trespass upon the location which opened the flip 3 to the body 2 from both sound holes 20 and 21. When close-talking ECM 11 comes to act with an original property, brings close-talking ECM 11 close to the month and talks over the telephone. The proximity effect is acquired and a speech quality comes to be secured good, and on the other hand, in the location which closed the flip 3 to the body 2, if rotation actuation is carried out. Since one sound hole 20 of close-talking ECM 11 is blockaded with packing 24, the sound hole 21 of another side is opened wide and an acoustic wave comes to invade only from a sound hole 21. Close-talking ECM 11 comes to act as indirectional (omnidirectional characteristic) ECM in false, and even if it is the case where place personal handy phone equipment 1 for example, on a desk, and it talks over the telephone, a speech quality comes to be secured good.

[0032] Whether it is the case where bring close-talking ECM 11 close to the month, and it talks over the telephone by carrying out a deer and carrying out rotation actuation of the flip 3 in this thing or is the case where separate close-talking ECM 11 from the month, and it talks over the telephone, thereby, there is nothing [ a thing ] that can secure a speech quality good in the case of both sides and a use gestalt will be restricted, and it can aim at improvement in user-friendliness. Especially, effectiveness which was mentioned above can be acquired in this case by comparatively easy actuation of carrying out rotation actuation of the flip 3.

[0033] moreover, when a user performs a key stroke, and CPU can be set as the normal mode or handsfree mode and it is set as handsfree mode in that case. Since it constituted from a time of being set as the normal mode so that the output level of a loudspeaker and the input level of close-talking ECM 11 might go up. By carrying out rotation actuation and setting it as the location which opened the flip 3 to the body 2 further at the normal mode. By carrying out rotation actuation in the location which could make the speech quality suitable, on the other hand closed the flip 3 to the body 2, and setting it as handsfree mode further. An output level and an input level can be made suitable and a speech quality can be made suitable also in this case.

[0034] Now, artificers measured the relative sensibility to a frequency conventionally with the thing of the configuration by this example explained above about the thing (personal handy phone equipment of the conventional microphone flip mold) of a configuration. Drawing 6 shows the measurement result obtained by the measurement, an axis of abscissa shows a frequency, and the axis of ordinate shows relative sensibility, and L shows the distance of a sound source and close-talking ECM 11.

[0035] In addition, the Measuring condition is as follows.

(a) Set to the thing of a configuration in the thing of a configuration conventionally [ condition (b) ] which opened the flip conventionally. In the thing of the configuration by condition (d) this example which opened the flip in the thing of the configuration by condition (c) this example which closed the flip the condition which closed the flip -- about Measuring condition (a), (b), and (c) in this case. A measurement result as shown in drawing 6 (a) is obtained, that is, a sound source with a comparatively small ( $L=1\text{cm}$ ) distance with close-talking ECM 11 is received. Regardless of a frequency, relative sensibility is abbreviation regularity and it turns out to a sound source with a comparatively large ( $L=50\text{cm}$ ) distance with close-talking ECM 11 that relative sensibility is falling, that is, the contiguity property is acquired by low frequency.

[0036] On the other hand, about Measuring condition (\*\*), a measurement result as shown in drawing 6 (b) is obtained, that is, it turns out to a sound source with a comparatively large distance with close-talking ECM 11 that relative sensibility is abbreviation regularity regardless of a frequency.



[0037] By acquiring the proximity effect from the above thing by carrying out rotation actuation in the location which opened the flip 3 to the body 2, and carrying out rotation actuation by the thing of the configuration by this example, from it in the location which closed the flip 3 to the body 2 shows that a property equivalent to indirectional ECM is acquired.

[0038] Next, the 2nd example of this invention is explained with reference to drawing 7. In addition, the same sign is given to the same part as the 1st example, explanation is omitted, and a different part is explained hereafter. With the personal handy phone equipment 31 shown in this 2nd example, the proximity switch 32 as a movable detection means is arranged in the predetermined part of the body case 4. When it consists of photosensors and a body approaches, it is reflected by the body and the light which was able to be invested detects that reflected light, this proximity switch 32 is constituted so that an ON signal may be outputted.

[0039] That is, since the flip 3 is separated from the proximity switch 32 when the location opened to the body 2 has flip 3 in this case, an off signal is outputted to CPU from a proximity switch 32, and CPU operates by the normal mode based on the off signal being given from the proximity switch 32. Since the flip 3 is approaching the proximity switch 32 on the other hand when it is in the location which the flip 3 closed to the body 2, an ON signal is outputted to CPU from a proximity switch 32, and CPU operates in handsfree mode based on the ON signal being given from the proximity switch 32.

[0040] Thus, according to the 2nd example, the same operation effectiveness as the 1st example mentioned above can be acquired, and especially, in this 2nd example, since the normal mode and handsfree mode are switched by not a key stroke but rotation actuation of flip 3 unlike the 1st example mentioned above, improvement in operability can be aimed at.

[0041] This invention is not limited only to the above-mentioned example, and can be transformed or extended as follows. As telephone equipment, you may be personal handy phone equipment of not only the personal handy phone equipment of a microphone flip mold but a flip mold, and may apply to the configuration which prepares packing in a flip, then other good telephone equipments, such as a cell phone unit and telephone equipment for mount, in that case.

[0042] What is necessary is just to consider as the configuration by which one sound hole of Close-talking ECM is opened and closed by carrying out movable [ of the member ] in that case that what is necessary is just the member which carries out movable not only to a flip but to a body as moving-part material. In the 2nd example, a proximity switch may consist of other sensors, such as what [ not only ] consists of photosensors but a magnetometric sensor, an ultrasonic sensor, etc.

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TECHNICAL FIELD

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[Field of the Invention] This invention relates to telephone equipment equipped with the close-talking electret capacitor microphone which has the sound hole by which an acoustic wave can invade into the both sides which sandwich a diaphragm.

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 TECHNICAL PROBLEM
 

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[Problem(s) to be Solved by the Invention] Conventionally, as a microphone of a cell phone unit or personal handy phone equipment (PHS), the electret capacitor microphone (it is hereafter called ECM (Electret Condenser Microphone) for short) is adopted. If it is in the condition close to a fixed electrode, it has the composition that the diaphragm which carried out permanent electrification of the front face has been arranged and an acoustic wave invades from a sound hole, according to a diaphragm vibrating, the electrostatic capacity between a diaphragm and a fixed electrode changes, an acoustic wave will be changed into an electrical signal and this ECM will be outputted. In this case, in such ECM, an indirectional (omnidirectional characteristic) property is acquired by preparing the sound hole into which an acoustic wave invades only in an one direction to a diaphragm, and considering as the configuration on which an acoustic wave acts only from an one direction to a diaphragm.

[0003] By the way, since such a cell phone unit and personal handy phone equipment are used outdoors etc. by the use gestalt in many cases, it is required that a perimeter [ -proof ] noise property should be good. From such a situation, it considers adopting a close-talking electret capacitor microphone (it being hereafter called Close-talking ECM for short) excellent in the perimeter [ -proof ] noise property instead of ECM mentioned above as a microphone of a cell phone unit or personal handy phone equipment by recent years.

[0004] This close-talking ECM has the composition that the sound hole was prepared in the both sides which sandwich a diaphragm, and the difference of the sound pressure of the acoustic wave which invaded through one sound hole, and the sound pressure of the acoustic wave which invaded through the sound hole of another side acts on a diaphragm as a sound pressure gradient. in this case, sound pressure gradient  $P_s$  when an acoustic wave is given to Close-talking ECM as a spherical wave Sound pressure gradient  $P_f$  when an acoustic wave is given to Close-talking ECM as a plane wave It differs and is these sound pressure gradient  $P_s$ . Sound pressure gradient  $P_f$  Generally a ratio is expressed with the distance  $c$ :acoustic-velocity  $f$ :frequency from a distance  $r$ :sound source between  $P_s/P_f = \{1 - (2d/r) + (c/2\pi fr)^2\} / 2d$ :sound terminals.

[0005] It is the sound pressure gradient [ as opposed to / in Close-talking ECM / so that clearly from the above-mentioned formula / a spherical wave in a low frequency band ]  $P_s$ . Sound pressure gradient  $P_f$  to a plane wave It has the property that a ratio becomes large, that is, the sensibility to a spherical wave becomes good relatively rather than the sensibility to a plane wave.

[0006] By the way, a microphone will be given in the condition near [ since the acoustic wave of the voice uttered by people since the microphone was usually brought close to the month and it talked over the telephone when the user generally used cell phone unit and personal handy phone equipment has a comparatively small distance of a sound source and a microphone ] a spherical wave. On the other hand, since the distance of a sound source and a microphone is comparatively large, the acoustic wave of a perimeter noise will be given to a microphone in the condition near a plane wave.

[0007] Therefore, in that as which Close-talking ECM was adopted as a microphone, since it has a property which Close-talking ECM mentioned above, the sensibility to the acoustic wave of the voice uttered by people becomes good relatively rather than the sensibility to the acoustic wave of a perimeter

noise, that is, the proximity effect comes to be acquired, there is little effect by the perimeter noise and a speech quality is secured good.

[0008] However, if it puts in another way, when placing the cell phone unit and personal handy phone equipment with which Close-talking ECM was adopted as a microphone for example, on a desk, separating them from the mouth and talking over the telephone, since the distance of a sound source and a microphone is comparatively large, I hear that the sensibility to the acoustic wave of the voice uttered by people will fall, and a speech quality will deteriorate, and there is this. Moreover, since there is a situation that a speech quality will deteriorate when the distance of a sound source and a microphone becomes comparatively large in this way, a use gestalt will be restricted and there is also a problem of being inferior to user-friendliness.

[0009] It is in this invention being made in view of the above-mentioned situation, and offering the telephone equipment which the purpose can keep a speech quality good in the thing equipped with the close-talking electret capacitor microphone which has the sound hole by which an acoustic wave can invade into the both sides which sandwich a diaphragm, without being restricted to a use gestalt, and can aim at improvement in user-friendliness by it.

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[Translation done.]

**\* NOTICES \***

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2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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**MEANS**

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[Means for Solving the Problem] If moving-part material is located in the 1st operating state location to a body, since the sound hole of the both sides of a close-talking electret capacitor microphone (close-talking ECM) will come to be opened wide according to invention of claim 1, an acoustic wave comes to invade from both sound holes. Therefore, since Close-talking ECM comes to act with an original property at this time, when a user uses telephone equipment according to an anticipated-use gestalt (i.e., when bringing Close-talking ECM close to the month and talking over the telephone), the proximity effect is acquired and a speech quality comes to be secured good.

[0011] On the other hand, since one sound hole of Close-talking ECM is opened wide and the sound hole of another side comes to be blockaded by the sound hole lock out member when moving-part material is located in the 2nd operating state location to a body, an acoustic wave comes to invade only from one sound hole. therefore -- since Close-talking ECM comes to act as an indirectional (omnidirectional characteristic) electret capacitor microphone (ECM) in false at this time -- a user -- telephone equipment -- usually -- \*\*\*\* -- when using it according to a different use gestalt that is, even if it is the case where separate Close-talking ECM from the month and it talks over the telephone, a speech quality comes to be secured good.

[0012] Whether it is the case where bring Close-talking ECM close to the month, and it talks over the telephone by carrying out a deer and carrying out movable [ of the moving-part material ] between the 1st operating state location and the 2nd operating state location in this thing or is the case where separate Close-talking ECM from the month and it talks over the telephone, in the case of both sides, a speech quality can be secured good. Thereby, improvement in user-friendliness can be aimed at so that a use gestalt may not be restricted.

[0013] According to invention of claim 2, the operation effectiveness which was indicated to claim 1 can be acquired by comparatively easy actuation of rotating a flip to a body.

[0014] According to invention of claim 3, if a predetermined key stroke is carried out, telephone equipment will come to operate in either mode of the normal mode and handsfree mode. By carrying out a deer, making the 1st operating state location carry out movable [ of the moving-part material ], and performing a further predetermined key stroke in this thing, it can have an original property, Close-talking ECM can be made to act, where telephone equipment is made into the normal mode now, and, thereby, a speech quality can be made suitable.

[0015] On the other hand, where telephone equipment is made into handsfree mode by making the 2nd operating state location carry out movable [ of the moving-part material ], and performing a further predetermined key stroke, while making Close-talking ECM act as indirectional ECM in false, an output level and an input level can be made suitable now, and, thereby, a speech quality can be made suitable also in this case.

[0016] According to invention of claim 4, movable, then telephone equipment come to operate moving-part material in either mode of the normal mode and handsfree mode. The same operation effectiveness as a thing according to claim 3 can be acquired by carrying out a deer and carrying out movable [ of the moving-part material ] between the 1st operating state location and the 2nd operating state location in

this thing. Moreover, since it is not necessary to perform a key stroke at all at this time, improvement in operability can be aimed at.

[0017]

[Embodiment of the Invention] Hereafter, this invention is explained with reference to drawing 1 thru/drawing 6 about the 1st example applied to the personal handy phone equipment (PHS) of a microphone flip mold (mold with which the microphone was formed in the flip). First, in drawing 1 which shows the whole personal handy phone equipment configuration of a microphone flip mold, to the body 2, the rotation axis A is formed in the flip 3 as moving-part material rotatable as a rotation core, and personal handy phone equipment 1 is constituted. It is in a body 2 and the sound hole 5 is formed in the upper part of the body case 4 made from plastics, it is in the interior of the body case 4, and the loudspeaker (not shown) is arranged in the part corresponding to the above-mentioned sound hole 5. The acoustic wave which carried out the deer and was emitted from the loudspeaker is outputted outside through a sound hole 5.

[0018] Moreover, the display 6 is formed in the body case 4, it is in the interior of the body case 4, and the liquid crystal display (not shown) is arranged in the part corresponding to the above-mentioned display 6. When a deer is carried out and a liquid crystal display drives, the telephone number, a message, etc. are displayed on a display 6.

[0019] It is in a body 2 and the key stroke section 7 is formed in the drawing 1 Nakashita half section. In this key stroke section 7 A "message" key, "re-dialing" key, "termination" key, a "telephone directory" key, A "hold" key, a "mode" key, the numerical keypad of - "9" and "0" "\*" (asterisk) key, the "# (Sharp)" key, "sound recording/playback" key, a "rise scrolling" key, and the various keys of a "dounce crawl" key are arranged. Moreover, antenna case section 4a is prepared in the body case 4 at one at the upper part side of the body case 4, and the whip antenna (not shown) is arranged in the interior of the antenna case section 4a.

[0020] It is in flip 3, sound holes 9 and 10 are formed in the both-sides surface part of the flip case 8 made from plastics so that it may counter, as shown also in drawing 2, it is in the interior of the flip case 8, and the close-talking electret capacitor microphone (it is hereafter called Close-talking ECM for short) 11 is arranged in the part corresponding to the above-mentioned sound holes 9 and 10. In addition, the sound hole 9 is shown in drawing 1.

[0021] Close-talking ECM 11 has composition as shown in drawing 3. That is, it is in the interior of the case 12 of close-talking ECM 11, and the printed circuit board 13 is arranged by the method of drawing 3 Nakashita, and FET15 which constitutes a bypass capacitor 14 and an impedance-conversion circuit is mounted on the printed circuit board 13. After having been supported by the insulator 16, the fixed electrode 17 is arranged by the method of drawing 3 Nakagami of a printed circuit board 13, and the diaphragm 19 is arranged by the method of drawing 3 Nakagami of this fixed electrode 17 in the condition of having consisted a fixed electrode 17 and predetermined spacing with the spacer 18. This diaphragm 19 consists for example, of giant-molecule plastic film, and permanent electrification of the front face was carried out by having performed special electrical treatment (the electret was carried out).

[0022] Moreover, the sound hole 20 which is open for free passage to one sound hole 9 of the flip 3 mentioned above is formed in the drawing 3 Nakagami surface part of a case 12, a deer is carried out, an acoustic wave trespasses upon the interior of the case 12 of close-talking ECM 11 through the sound hole 9 of flip 3, and the sound hole 20 of close-talking ECM 11 from the exterior, and the acoustic wave which invaded acts on a diaphragm 19.

[0023] On the other hand, the sound hole 21 which is open for free passage to the sound hole 10 of another side of the flip 3 mentioned above is formed in the drawing 3 Nakashita surface part of a case 12, and a sound hole 22 is formed in a printed circuit board 13, and sound holes 23 and 23 are further formed in the fixed electrode 17. A deer is carried out, an acoustic wave trespasses upon the interior of the case 12 of close-talking ECM 11 through the sound hole 10 of flip 3, and the sound hole 21 of close-talking ECM 11 from the exterior, and the acoustic wave which invaded acts on a diaphragm 19 through the sound hole 22 of a printed circuit board 13, and the sound holes 23 and 23 of a fixed electrode 17.

[0024] Thus, driver voltage is supplied through high resistance between a diaphragm 19 and a fixed electrode 17, and the constituted close-talking ECM 11 is in the condition. If it trespasses upon the interior of a case 12 as the acoustic wave mentioned above, and it acts on a diaphragm 19 According to a diaphragm 19 vibrating, the electrostatic capacity between a diaphragm 19 and a fixed electrode 17 changes, impedance conversion of the output voltage is carried out by the above-mentioned impedance-conversion circuit, and it is outputted.

[0025] It is in the key stroke section 7 of a body 2, and the packing 24 (refer to drawing 1) which consists of silicone rubber as a sound hole lock out member is formed in the predetermined part. In this case, as shown in drawing 4, when the location closed to the body 2 has flip 3, one sound hole 9 of flip 3 is blockaded with packing 24, as shown in drawing 5. In addition, elastic deformation is carried out although packing 24 is slight at this time.

[0026] And in the personal handy phone equipment 1 constituted in this way, if a key stroke to set CPU as the normal mode and for a user set it as handsfree mode, if a key stroke for CPU to operate in either mode of the normal mode or handsfree mode, and for a user set it as the normal mode is performed is performed, CPU will be set as handsfree mode. In this case, when CPU is set as handsfree mode, as for personal handy phone equipment 1, the output level of a loudspeaker and the input level of close-talking ECM 11 go up rather than the time of CPU being set as the normal mode.

[0027] Next, an operation of the above-mentioned configuration is explained. If a user does rotation actuation of the flip 3 in the location (1st operating state location as used in the field of this invention) opened to the body 2 as shown in drawing 2, at this time, the sound holes 9 and 10 of flip 3 will not be blockaded, that is, the sound holes 20 and 21 of close-talking ECM 11 will not be blockaded, and both these sound holes 20 and 21 will come to be opened wide. Therefore, if it is in close-talking ECM 11, while an acoustic wave invades through a sound hole 20 from the exterior (refer to drawing 2 Nakaya mark P), an acoustic wave comes (refer to drawing 2 Nakaya mark Q) to invade through a sound hole 21 from the exterior, that is, an acoustic wave invades from the direction of both, and it comes to act on a diaphragm 19.

[0028] If a user has the personal handy phone machine 1 in a hand, brings close-talking ECM 11 close to the month and talks over the telephone at this time, the acoustic wave of the voice uttered by people Since the distance of a sound source and close-talking ECM 11 is comparatively small, it is given to close-talking ECM 11 in the condition near a spherical wave. On the other hand, the acoustic wave of a perimeter noise Since the distance of a sound source and close-talking ECM 11 is comparatively large, with the property which it will be given to close-talking ECM 11 in the condition near a plane wave, and close-talking ECM 11 has The sensibility to the acoustic wave of the voice uttered by people becomes good relatively rather than the sensibility to the acoustic wave of a perimeter noise, that is, the proximity effect comes to be acquired. Thereby, a speech quality comes to be secured good.

[0029] As shown in drawing 4, when a user does rotation actuation of the flip 3, in the location (2nd operating state location as used in the field of this invention) closed to the body 2 At on the other hand, this time As one sound hole 9 of flip 3 mentioned above, it is blockaded with packing 24. That is, one sound hole 20 of close-talking ECM 11 is blockaded, and the sound hole 10 of another side of flip 3 is not blockaded, that is, only the sound hole 21 of another side of close-talking ECM 11 comes to be opened wide. Therefore, if it is in close-talking ECM 11, an acoustic wave comes (refer to drawing 5 Nakaya mark R) to invade only through a sound hole 21 from the exterior, that is, an acoustic wave comes to act on a diaphragm 19 from one direction. Namely, close-talking ECM 11 comes to act as an indirectional (omnidirectional characteristic) electret capacitor microphone (it is hereafter called ECM for short) at this time.

[0030] If a user places the personal handy phone machine 1 for example, on a desk, separates close-talking ECM 11 from the month and talks over the telephone at this time, since close-talking ECM 11 will act as indirectional (omnidirectional characteristic) ECM, even if it is this case, a speech quality comes to be secured good.

[0031] Thus, if rotation actuation is carried out, since according to the 1st example the sound holes 20 and 21 of the both sides of close-talking ECM 11 will be opened wide and an acoustic wave will come

to trespass upon the location which opened the flip 3 to the body 2 from both sound holes 20 and 21. When close-talking ECM 11 comes to act with an original property, brings close-talking ECM 11 close to the month and talks over the telephone. The proximity effect is acquired and a speech quality comes to be secured good, and on the other hand, in the location which closed the flip 3 to the body 2, if rotation actuation is carried out. Since one sound hole 20 of close-talking ECM 11 is blockaded with packing 24, the sound hole 21 of another side is opened wide and an acoustic wave comes to invade only from a sound hole 21. Close-talking ECM 11 comes to act as indirectional (omnidirectional characteristic) ECM in false, and even if it is the case where place personal handy phone equipment 1 for example, on a desk, and it talks over the telephone, a speech quality comes to be secured good.

[0032] Whether it is the case where bring close-talking ECM 11 close to the month, and it talks over the telephone by carrying out a deer and carrying out rotation actuation of the flip 3 in this thing or is the case where separate close-talking ECM 11 from the month, and it talks over the telephone, thereby, there is nothing [ a thing ] that can secure a speech quality good in the case of both sides and a use gestalt will be restricted, and it can aim at improvement in user-friendliness. Especially, effectiveness which was mentioned above can be acquired in this case by comparatively easy actuation of carrying out rotation actuation of the flip 3.

[0033] moreover, when a user performs a key stroke, and CPU can be set as the normal mode or handsfree mode and it is set as handsfree mode in that case. Since it constituted from a time of being set as the normal mode so that the output level of a loudspeaker and the input level of close-talking ECM 11 might go up. By carrying out rotation actuation and setting it as the location which opened the flip 3 to the body 2 further at the normal mode. By carrying out rotation actuation in the location which could make the speech quality suitable, on the other hand closed the flip 3 to the body 2, and setting it as handsfree mode further. An output level and an input level can be made suitable and a speech quality can be made suitable also in this case.

[0034] Now, artificers measured the relative sensibility to a frequency conventionally with the thing of the configuration by this example explained above about the thing (personal handy phone equipment of the conventional microphone flip mold) of a configuration. Drawing 6 shows the measurement result obtained by the measurement, an axis of abscissa shows a frequency, and the axis of ordinate shows relative sensibility, and L shows the distance of a sound source and close-talking ECM 11.

[0035] In addition, the Measuring condition is as follows.

(a) Set to the thing of a configuration in the thing of a configuration conventionally [ condition (b) ] which opened the flip conventionally. In the thing of the configuration by condition (d) this example which opened the flip in the thing of the configuration by condition (c) this example which closed the flip the condition which closed the flip -- about Measuring condition (a), (b), and (c) in this case. A measurement result as shown in drawing 6 (a) is obtained, that is, a sound source with a comparatively small ( $L=1\text{cm}$ ) distance with close-talking ECM 11 is received. Regardless of a frequency, relative sensibility is abbreviation regularity and it turns out to a sound source with a comparatively large ( $L=50\text{cm}$ ) distance with close-talking ECM 11 that relative sensibility is falling, that is, the contiguity property is acquired by low frequency.

[0036] On the other hand, about Measuring condition (\*\*), a measurement result as shown in drawing 6 (b) is obtained, that is, it turns out to a sound source with a comparatively large distance with close-talking ECM 11 that relative sensibility is abbreviation regularity regardless of a frequency.

[0037] By acquiring the proximity effect from the above thing by carrying out rotation actuation in the location which opened the flip 3 to the body 2, and carrying out rotation actuation by the thing of the configuration by this example, from it in the location which closed the flip 3 to the body 2 shows that a property equivalent to indirectional ECM is acquired.

[0038] Next, the 2nd example of this invention is explained with reference to drawing 7. In addition, the same sign is given to the same part as the 1st example, explanation is omitted, and a different part is explained hereafter. With the personal handy phone equipment 31 shown in this 2nd example, the proximity switch 32 as a movable detection means is arranged in the predetermined part of the body case 4. When it consists of photosensors and a body approaches, it is reflected by the body and the light



which was able to be invested detects that reflected light, this proximity switch 32 is constituted so that an ON signal may be outputted.

[0039] That is, since the flip 3 is separated from the proximity switch 32 when the location opened to the body 2 has flip 3 in this case, an off signal is outputted to CPU from a proximity switch 32, and CPU operates by the normal mode based on the off signal being given from the proximity switch 32. Since the flip 3 is approaching the proximity switch 32 on the other hand when it is in the location which the flip 3 closed to the body 2, an ON signal is outputted to CPU from a proximity switch 32, and CPU operates in handsfree mode based on the ON signal being given from the proximity switch 32.

[0040] Thus, according to the 2nd example, the same operation effectiveness as the 1st example mentioned above can be acquired, and especially, in this 2nd example, since the normal mode and handsfree mode are switched by not a key stroke but rotation actuation of flip 3 unlike the 1st example mentioned above, improvement in operability can be aimed at.

[0041] This invention is not limited only to the above-mentioned example, and can be transformed or extended as follows. As telephone equipment, you may be personal handy phone equipment of not only the personal handy phone equipment of a microphone flip mold but a flip mold, and may apply to the configuration which prepares packing in a flip, then other good telephone equipments, such as a cell phone unit and telephone equipment for mount, in that case.

[0042] What is necessary is just to consider as the configuration by which one sound hole of Close-talking ECM is opened and closed by carrying out movable [ of the member ] in that case that what is necessary is just the member which carries out movable not only to a flip but to a body as moving-part material. In the 2nd example, a proximity switch may consist of other sensors, such as what [ not only ] consists of photosensors but a magnetometric sensor, an ultrasonic sensor, etc.

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[Translation done.]

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

**[Drawing 1]** The appearance perspective view in which showing the 1st example of this invention and showing the condition that the flip opened to the body

**[Drawing 2]** The side elevation in which showing the condition that the flip opened to the body, and showing a part in a cross section

**[Drawing 3]** The vertical section side elevation of Close-talking ECM

**[Drawing 4]** The side elevation showing the condition that the flip closed to the body

**[Drawing 5]** The vertical section side elevation in which showing the condition that the flip closed to the body, and showing an important section

**[Drawing 6]** Drawing showing a measurement result

**[Drawing 7]** The drawing 1 equivalent Fig. showing the 2nd example of this invention

**[Description of Notations]**

the inside of a drawing, and 1 -- personal handy phone equipment (telephone equipment) and 2 -- a body and 3 -- for a diaphragm, and 20 and 21, as for packing (sound hole lock out member) and 31, a sound hole and 24 are [ a flip (moving-part material) and 11 / a close-talking electret capacitor microphone and 19 / personal handy phone equipment (telephone equipment) and 32 ] proximity switches (movable detection means).

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[Translation done.]